MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2017/2018

TWM3431 – DIGITAL WATERMARKING

(All sections / Groups)

3 March 2018
2:30 P.M. – 4:30 P.M.
(2 Hours)

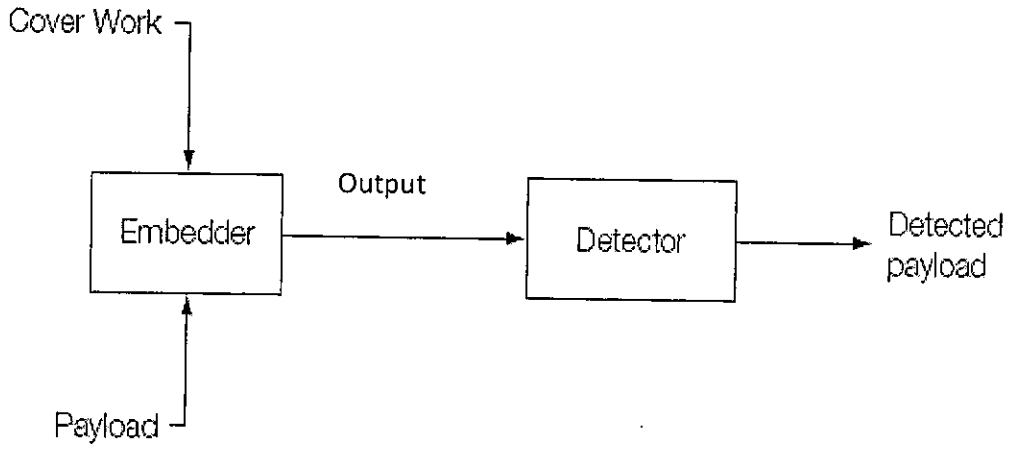
INSTRUCTIONS TO STUDENTS

1. This question paper consists of 6 pages, including the cover page.
2. Answer **ALL** questions
3. The distribution of the marks for each question is given.
4. Please print all your answers in the Answer Booklet provided.

Answer **ALL** the questions

QUESTION 1

(a) Steganography and watermarking share a common system, which both consist of an embedder and a detector, as illustrated below.



Explain the terminologies of ***Cover Work***, ***Payload***, ***Embedder Output*** and ***Detected Payload***.

[4 marks]

(b) It is well known that **"the first line of defence against illegal copying is cryptography"**. From the statement above, can we deduce that cryptography is able to absolutely protect copyrighted contents from piracy? Justify your answer.

[4 marks]

(c) The sudden increase in watermarking interest is most likely due to the increase of concern over copyright protection of content. One of the main factors is the popularity of the Internet. The Internet is claimed to be an excellent distribution system for digital media. Do you agree that? Justify your answer.

[4 marks]

CONTINUED .....

QUESTION 2

(a) Watermarking can be distinguished from other information hiding techniques in **THREE [3]** important ways/ attributes. What are the important attributes of watermarks?

[3 marks]

(b) Explain the following watermarking applications using your own words:

i. Owner identification
ii. Proof of ownership
iii. Transaction tracking
iv. Content authentication

[4 marks]

(c) Discuss the major limitation of textual copyright notices in owner identification of a work with an appropriate example.

[2 marks]

(d) A selective authentication process detects applications of illegitimate distortions, while ignoring applications of legitimate distortions.
Comprehend **THREE [3]** basic approaches which can be used for selective authentication.

[3 marks]

CONTINUED .....

QUESTION 3

(a) You are assigned to design message marks for a set of messages. What would you concern when performing the message mark design? [Hint: message mark design concern and criteria]

[4 marks]

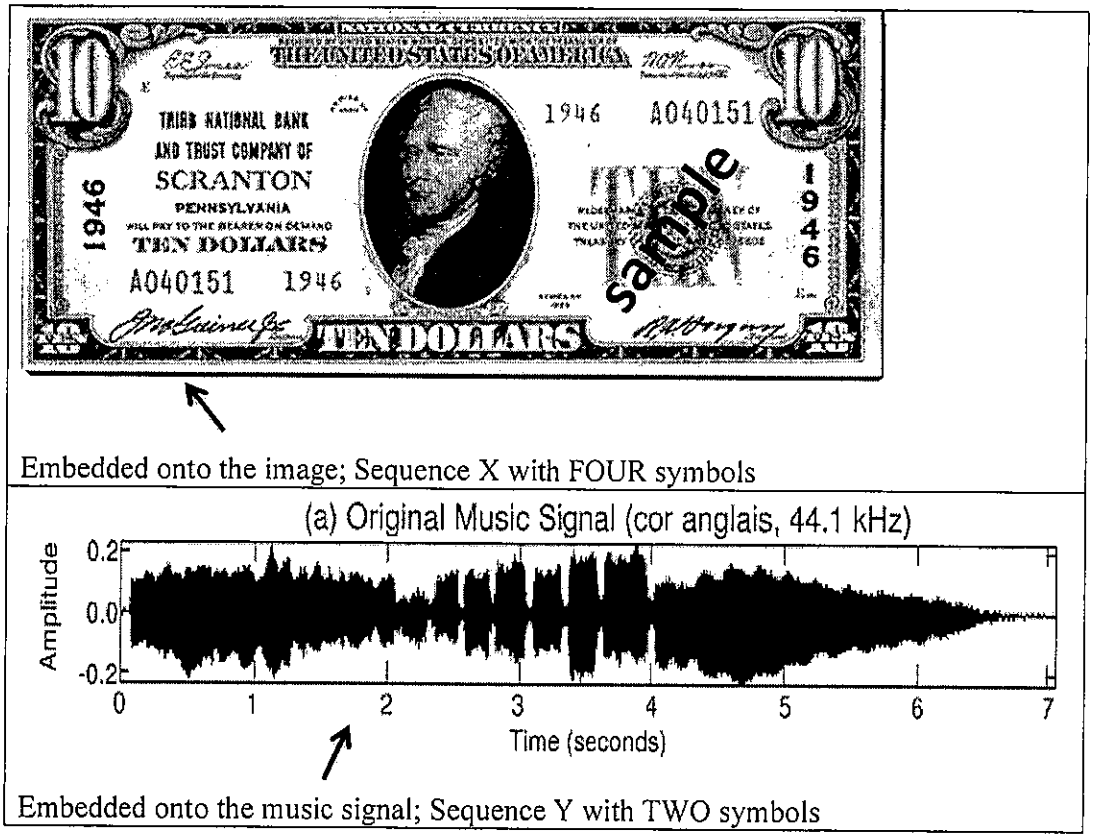
(b) Modulation can be performed in a variety of ways, including **time-division multiplexing, space-division multiplexing, frequency-division multiplexing**, and **code-division multiplexing**. Describe each of these modulation techniques using your own words.

[4 marks]

(c) You have two sequences of symbols:

i. Sequence X consists of **FOUR [4]** symbols
ii. Sequence Y consists of **TWO [2]** symbols

You wish to embed Sequence X onto USD currency note with the size of 1050 by 1050 pixels (as shown in the figure below) and embed Sequence Y onto a music clip with the length of 7 seconds (as shown in the figure below).
Explain how you can accomplish the tasks.

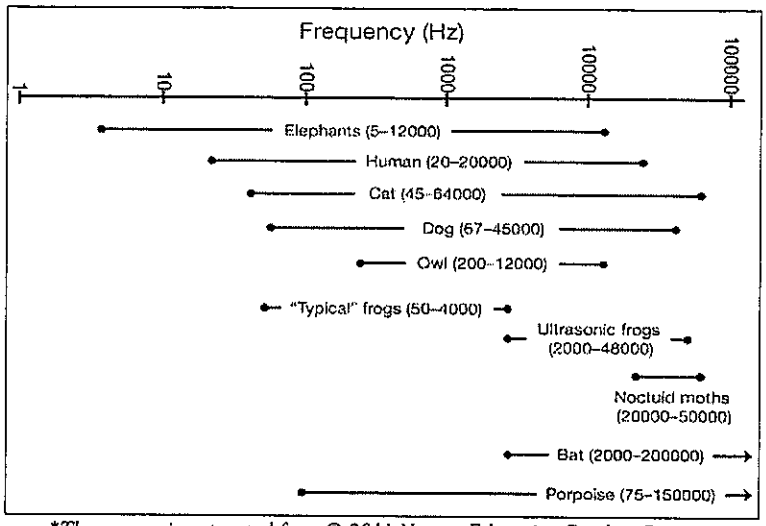


[4 marks]

CONTINUED .....

QUESTION 4

(a) The figure below shows the hearing sensitivity for human and some animals.



**The source is extracted from © 2011 Nature Education Stephen Burnett.*

Mary plans to place a large proportion of the watermark signals in a music clip for ownership protection. Note that the watermarking embedding should not affect the quality of the music. Describe a way to embed watermark signals in the music clip. Which frequency range would you embed the watermark signals? Justify your answer.

[4 marks]

(b) ***"Cryptographic techniques help in solving the problem of unauthorized decoding"*** What is your opinion?

[3 marks]

(c) A classical experimental paradigm for measuring perceptual phenomena is the two-alternative forced choice (2AFC). Describe this paradigm with an appropriate example.

[5 marks]

CONTINUED ....

QUESTION 5

(a) It is understood that **watermark robustness is a necessary property if a watermark is to be secure.** Suggest **FIVE [5]** approaches that can be used to make watermarks robust. Briefly explain the approaches.

[5 marks]

(b) Mary plans to embed a watermark in all coefficients of a work's representation. Do you agree with her? Justify your answer and suggest a better way.

[4 marks]

(c) What is the major difficulty of inverting distortions in the watermark detector?

[3 marks]

END OF PAPER